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A Trial of the Suitability and Practicality
of a Proposed Meal Based Ration
Scale

G.J. Walker, C.H. Forbes-Ewan,
J.E. Carins, G.E. Driver, G.F. Thomson
and P. Moran

DSTO-TR-0723

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and P. Moran**

**Combatant Protection and Nutrition Branch
Aeronautical and Maritime Research Laboratory**

*** Directorate of Catering - ARMY**

DSTO-TR-0723

ABSTRACT

This report describes a trial of a proposed new means of determining food entitlements for soldiers in barracks.

The aim of the trial was to determine the suitability and practicality of meal based rationing, together with a new means of determining entitlements to food. This system of feeding is known as Attendance - Based Rationing.

The proposed system has been implemented by Army as a means of increasing the efficiency of Army catering.

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Executive Summary

As a result of R&D conducted under Task 93/143 *Nutritional Basis for ADF Feeding*, a proposed revised basic ration scale was developed. This scale provides a higher proportion of food as carbohydrate than does the existing scale. It is also based on diners attending each meal, rather than the daily scale based on ration strength. Field studies of food intake and energy expenditure conducted on ADF members in a wide variety of operational and training scenarios provided the necessary scientific background for the scale.

The effectiveness and efficiency of the new scale were trialled over a seven day study period in the East Hills Other Ranks (ORs) Mess. Due to some soldiers preparing for commando duties, this mess had a high activity level, with additional sport, PT and weight training being undertaken by the soldiers.

The new meal - based scale makes available 5350 kJ per person per breakfast, and 5660 kJ per person per lunch/dinner.

Mean food intake at breakfast was 3,560 kJ. The corresponding results for lunch and dinner were 5,085 kJ and 5,160 kJ respectively. Wastage of food was 13.1% of the food made available. This is within the agreed level of acceptable wastage (15%).

The proportion of the consumed energy supplied as fat (41%) is considered too high. Nutrition education is recommended for caterers and soldiers.

Usage of most serials of the proposed scale, from the stocktake figures averaged over the seven days of the study, was close to the entitlement. The meal to meal variation was much greater when the meal by meal consumption figures were analysed. It is considered that accounting for food usage will need to be over a 28 day period to even out the expected daily fluctuations.

The proposed meal based ration scale and accounting for foods on the basis of numbers fed is suitable and practical for Army feeding in a barracks situation, as it allows for fluctuations in diner attendance at meals. The success of implementing the proposed meal based entitlement is vitally dependent upon accurate predictions of numbers attending meals.

Properly implemented, the proposed scale will ensure optimal food supply to the consumer, and should result in cost savings to the ADF.

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Trained as a biochemist, Chris has nearly 25 years experience in food science, having worked as a nutritional analyst, food microbiologist and, since 1986, as Senior Nutritionist at DNRC. Since that time he has led a team that has conducted extensive research into food acceptability, food intake, energy expenditure and performance enhancement of ADF members.

Julia E. Carins

Combatant Protection and Nutrition Branch

Julia Carins, BSc, began work at the Defence Nutrition Research Centre in 1996, and since that time has been involved with many research projects, varying in nature. She undertakes work in all areas of DNRC, from chemistry and microbiology to food technology and nutrition.

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Graham joined Defence in 1972, and has worked in all major areas of research undertaken within the Defence Nutrition Research Centre. Areas of specific research interest have included long term storage of foods, packaging technology, nutrition and energy expenditure, compression and drying, can corrosion and feeding aboard naval vessels.

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Since joining DSTO in 1980, Gary F. Thomson, B.App.Sc. (Dist) has served as an expert in food microbiology and represents Defence on National and International standards committees. In his position as Senior Microbiologist he leads a team which conducts studies of the microbiological safety of food and feeding systems used by Defence.

Paul Moran

Directorate of Catering - ARMY

WO1 Paul Moran (RSM) was representing Director of Catering - Army (DCATR-A) on the study team. WO Moran's role on the team was to provide advice and assistance to the DSTO Scientists on catering matters. He also used the trial to make recommendations on accounting options for the new system.

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1. Introduction

This report describes a trial of a proposed new means of determining food entitlements for soldiers in barracks.

Previously, Army's basis for feeding allowed a ration (one day's food for one soldier) to be drawn for all soldiers on ration strength. These entitlements were published in SUPMAN 4 (Department of Defence, 1994). Under the new system, which was trialled in response to a request from Director-General Material Management (DGMM), Headquarters Logistics Command - Army, ration accounting at Army messes is according to a meal entitlement, not a daily ration entitlement. The meal-based ration scales used in this study are detailed at Appendix 1.

Under this system, estimates are obtained of the number of diners likely to attend each meal. Food will be prepared for the predicted number of diners, with a small reserve providing the capacity to meet any shortfall with short order cooking. Accounting for meal entitlements is done retrospectively, with entitlement to draw food being based on the number of diners who actually attended meals (breakfasts or lunch/dinners) in the accounting period.

This system is known as Attendance Based Rationing (ABR). At the time of the trial (Nov 96) ABR was being considered for implementation by Army as a means of increasing the efficiency of Army catering.

There was also a request from the Director of Catering - Army (DCATR-A) to be involved in the development and conduct of the trial (Driver, 1995). An interim report by WO1 Paul Moran (DCATR-A representative on the study team) is at Appendix 2.

The mess used for the study—East Hills Other Ranks (ORs) Mess at Holsworthy—was chosen on the basis of:

- a large diner attendance (>150 average attendance at dinner);
- a variety of units representing a good cross section of the Australian Regular Army eating at the mess;
- no units to qualify for supplementary feeding (such as Arduous Duty Supplement or Cadet/Apprentice Supplement) during the study period; and
- historical data on meal attendance available to allow prediction of likely meal attendance during the study.

At the time of this study the following units were fed at the East Hills ORs mess:

1 Combat Engineers

4 RAR

104 Sig Sqn

1 BASB

17 Construction Sqn

145 Sig Sqn

1 Fd Hospital

1/15 RNSWL

BASC Liverpool

110 Sig Sqn

This report covers major trends and the indicative success/usefulness of the proposed meal based ration scale in:

- providing a nutritious diet and
- minimising food wastage and food costs.

The study also investigated the ease of use of meal-based rationing and the ability of the Army to accurately predict diner numbers.

The study period was seven days from the 23rd November 1996 to the 29th November 1996. The suggested revised ration scale shown at Appendix 1 was used by Logistics Command - Army to prepare a Basis of Issue/Program of Issue (BOI/POI) for the study period. A copy of the revised BOI/POI is at Appendix 3.

Because the software used by Army ('Armyfood') is designed for use with a daily ration scale, not for meal-based scales, the BOI/POI was not available prior to the trial and contained several errors. Consequently, food purchased against the existing BOI/POI (based on the daily ration scale of SUPMAN 4) was taken and the portion of food needed for the proposed study was made available. This quantity was based on the number of soldiers likely to attend each meal over the seven day study period. Any additional food was held in reserve and made available to the catering staff by the trial team as required.

To overcome errors in the prepared BOI/POI and the need to issue additional food to negate perceived shortfalls, all food issued during the study was related back to the proposed meal-based ration scales on a meal by meal basis, and on a total available food basis using the stocktake figures (see section 2.2) for the study period. Culinary adjuncts were made available from the Supplementary Rationing Allowance (SRA). At the time of the study, SRA was \$0.41 per person per day.

2. Methods

2.1 Meal Attendance

Estimates of the numbers likely to attend each meal were obtained from the Ration Clerk. These figures were used to determine the food to be made available according to the meal-based ration scales. This was consistent with the revised ration accounting system proposed by DCATR-A (1994).

A head count was made at each meal to determine the actual number of diners attending.

2.2 Food Availability

A direct determination was made of the gross food made available in the mess to soldiers over the study period. This was done by recording the weights and volumes of:

- all food in the mess on the evening before day 1 of the study
- all food entering or leaving the mess during the study and
- all food in the mess on the evening of day 7.

For each serial in the meal based scales, gross food availability over the seven day study period was determined. The quantity of each food made available was converted to a proportion of the entitlement, based on the number of soldiers attending breakfast, and those attending lunch or dinner.

The proportion of each serial used at each meal for each day was also determined.

Mean food availability at the servery was determined for each meal. This was achieved by weighing all containers taken to the servery before and after the meal, weighing servery wastage and weighing food that was not consumed, but was retained for later consumption. Food availability at the servery was converted to kilojoules (kJ) of energy availability using a nutritional database—'ADF NUT'—based on the NUTTAB database of the Australia New Zealand Food Authority (NUTTAB, 1991). ADF NUT includes an estimate of discard of inedible portions of food, for example, peel, bone and trimmed fat when estimating energy and nutrient availability. Energy availability for each meal at the servery was determined per capita by dividing the total energy availability for each meal by the total number of diners for that meal.

2.3 Food and Nutrient Intake and Wastage

Intake was determined at the servery separately for each meal. This is consistent with the suggestion by DCATR-A (1994) that under an ABR system, food entitlements should be according to meal (breakfast or lunch/dinner).

Intakes of main courses and desserts at each meal were estimated by weighing all food containers taken to the servery. Weighing was conducted before and after each meal. Differences in 'before' and 'after' weights determined the gross weight of food taken by diners from the servery. To determine net food intake, plate waste was deducted from the result for gross food taken from the servery.

A direct determination was made of the consumption of bread, dairy items, breakfast cereals, ancillary items, butter and margarine after each meal by weighing or by visual inspection, as appropriate.

An average consumption figure for non-perishable foods ('dries'), SRA items, cordials and juices was determined from stocktakes conducted on the evening before day 1 and again on the evening of day 7. These items represent only a small proportion of total food energy available, and this method of calculation has no significant adverse effect on the overall accuracy of the results.

The nutrient database ADFNUT, described above, was used to convert food intake to energy and nutrient intake.

Mean intake per person per meal was calculated separately for breakfast, lunch and dinner.

Wastage, directly determined at the mess, was attributed to the categories of servery and plate waste. Servery waste was estimated by weighing each bain taken to the servery before and after every meal, and the weight of leftover food discarded.

Plate waste was determined by retaining all food remaining on the plates of all diners, separating plate waste into individual food items, and weighing each food item.

Prepared food wastage was determined by adding servery waste to plate waste. Prepared food wastage is expressed as a percentage of total food made available at the servery.

Food wastage was converted to energy and nutrient wastage using ADFNUT.

No measurement was made in this study of food discarded before it could be presented to the diners. This discarded food consists predominantly of meat offcuts, bread used to drain excess oil from fried eggs, used cooking oil and trimmings from fruit and vegetables. Most of this is inedible, or no longer fit for consumption, and so is not considered to be 'wasted' food.

2.4 Acceptability Questionnaires

On days 6 and 7 of the study questionnaires were handed out to diners at both breakfast and dinner meals. During breakfast and dinner on day 6 diners served themselves, taking as much as they desired from the bain maries. On day 7 the cooks served the bacon and egg entitlement to each diner for breakfast and the meat entitlement to each diner for dinner. A copy of each questionnaire is shown at Appendix 4.

3. Results & Discussion

3.1 Meal Attendance

Table 1 gives information on the actual attendance at each meal, and predictions of attendance made by the Ration Clerk, based on historical and personal information. Also included is the number of entitled diners (ration strength) based on the forms (SQ97s) lodged with the Ration Clerk by the units rationed at East Hills ORs mess. It is the total number of rationed-in soldiers on the SQ97s for each day of the 28 day ration accounting period that determines (retrospectively) the number of rations that the Ration Clerk was permitted to draw on that day, according to the current rationing system.

The number of rationed-in diners who attended breakfast totalled 523 (mean 75 per day); rationed-in diners attending lunch totalled 839 (120 per day); for dinner the corresponding results were 845 (121 per day).

Over the period of the study the percentage of entitled diners attending breakfast, lunch and dinner was 36%, 62% and 58% respectively. Attendance at the mess was typical of other messes previously studied (Waters et al., 1995).

The total number of diners predicted by the Ration Clerk was 97% of the actual number of entitled diners who attended. However, from Figures 1, 2 and 3 below it is clear that the Ration Clerk could not consistently predict the actual number of diners who would attend each meal.

The worst discrepancies were:

- (i) The prediction by the Ration Clerk that 54 would attend breakfast on Monday (day 3), Tuesday (day 4), Wednesday (day 5) and Thursday (day 6); when 92, 102, 95 and 93 attended, respectively;
- (ii) The Ration Clerk predicted that 156 would attend dinner on Thursday (day 6) and 106 would attend dinner on Friday (day 7); when only 93 and 75 diners attended, respectively.

Table 1: Predicted, actual and ration strength diner numbers

	Breakfast			Lunch			Dinner		
	Predicted	Actual	Ration Strength	Predicted	Actual	Ration Strength	Predicted	Actual	Ration Strength
Day 1 Saturday	33	41	215	66	62	215	56	79	215
Day 2 Sunday	28	33	213	76	85	213	106	86	213
Day 3 Monday	54	92	190	166	171	173	186	186	190
Day 4 Tuesday	54	102	207	166	154	205	186	182	211
Day 5 Wednesday	54	95	203	166	124	186	186	144	203
Day 6 Thursday	54	93	207	106	112	190	156	93	207
Day 7 Friday	54	67	206	85	131	172	106	75	208
Totals	331	523	1441	831	839	1354	982	845	1447

Figure 1: Comparison of predicted, actual and ration strength diner numbers for breakfast

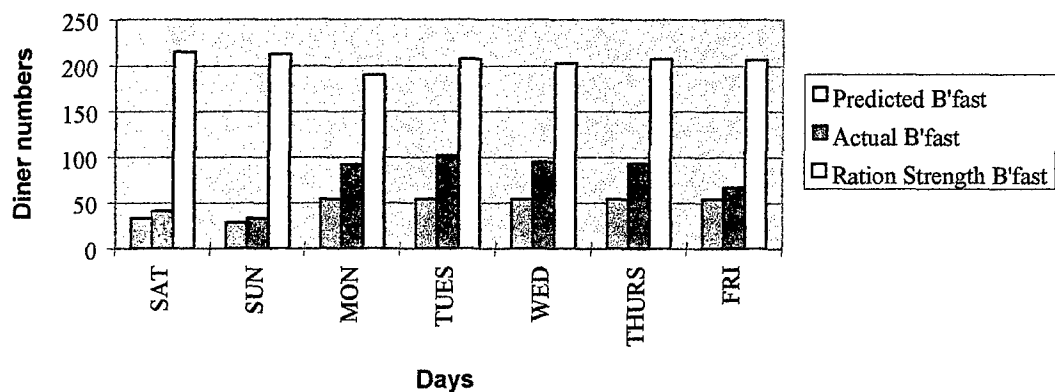


Figure 2: Comparison of predicted, actual and ration strength diner numbers for lunch

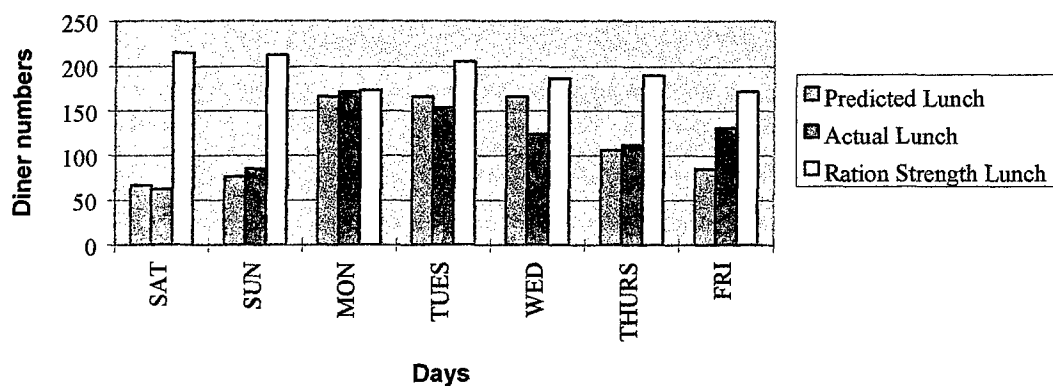
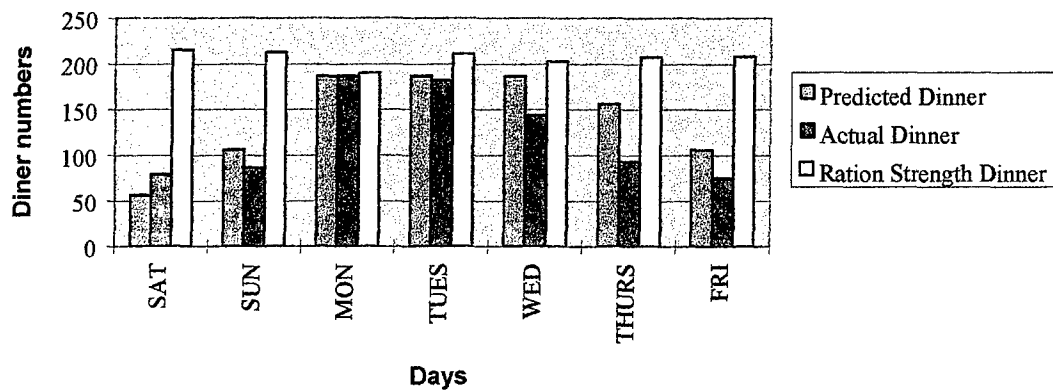


Figure 3: Comparison of predicted, actual and ration strength diner numbers for dinner



The estimates of numbers of expected diners for breakfast were poor, representing 63% of the actual numbers attending. These estimates of attendance were based on the historical number of plates, or hot breakfasts served. A large number of diners do not take hot meals, but consume juice, breakfast cereals and bread or toast and thus were not included in the estimates of likely numbers of breakfast diners.

The success of ABR will depend on the accuracy of the prediction of the number of diners likely to attend each meal. If the predicted number is too low, insufficient food may be provided; if the prediction is too high, excessive food wastage may result. To maximise efficiency of feeding it may be preferable to plan menus around the minimum likely number of diners, and use 'cooking to order' for diners in excess of this number.

It is likely that the accuracy of predictions of numbers attending would increase with experience. However, observations made at this study indicate that the ability of the Ration Clerk to predict diner numbers may be adversely affected by Army's means of determining ration entitlements. At the time of the trial there was a distinct lack of communication from units to the Ration Clerk on ration strength. The Ration Clerk used the SQ55 form as his authority to indent for rations. This contained his estimate of the likely ration strength for each day. Actual authorisation for ration indenting actually came from the numbers on the SQ97s provided by the units feeding at the mess.

The SQ97 form lodged by each unit had a space for estimation by the unit of likely ration strength one week in advance. To our knowledge this was rarely used. Consequently, the Caterer was frequently required to indent for rations (on the SQ55) without guidance from the units on likely ration strength. At the time of the study there was also a requirement for each unit to lodge its SQ97 by 1000 hours on the day to which it referred. However, some units did not lodge the SQ97 until two weeks after the due date (pers. comm. Roy Schmidtke, Ration Clerk, East Hills ORs mess). Unless communication improves between units and those who are responsible for predicting likely meal attendance, it is difficult to see how accurate predictions could be expected to be made. Unless such predictions are made possible, ABR will be difficult to put into practice.

Perhaps the most relevant information for estimating likely mess attendance is historical data on the numbers who normally attend. Anecdotal evidence suggests that some, but not all, Army messes already have access to this information.

It is recommended that collection of data on meal attendance, combined with information on ration strength will provide the best basis for predicting future meal attendance.

Given that some inaccuracies will always exist with unexpected absences or attendances at meals, flexibility of caterers to purchase food or have additional stocks must be built into the food procurement system. In addition it is recommended that accounting for food entitlements be according to a 28 day period. This is especially relevant if a 28 day menu cycle is used.

3.2 Food Availability

Appendix 5 shows the proportions of the entitlement to each food that was drawn over the seven day study period and made available in the ORs Mess. Table 2 summarises the information in Appendix 5, showing the proportion used of the total entitlement to each serial.

From Table 2 consumption of milk and milk products (Serial 1) was 30% greater than the entitlement according to the meal-based scales. This partially related to the popularity of the yoghurt and flavoured milk.

It was also observed that some soldiers removed milk (and other foods such as breakfast cereals and bread) from the mess following the evening meal, evidently to consume for breakfast the following morning. Because these breakfasts were consumed outside the mess, they were not included in the count of diners. This had the effect of exaggerating the proportion of these serials apparently consumed. If the removal of food from the mess is prevented, the proportions consumed of entitlements to foods affected by this 'unauthorised' feeding will be reduced closer to unity.

Even so, with consumption 30% greater than the entitlement, it is considered that the meal-based scales provided insufficient milk and milk products. Following the trial, the lunch/dinner entitlement to milk was increased from 200 mL to 250 mL (pers. comm. Senior Inspector of Foodstuffs).

Table 2: Proportion of serial used over 7 day study period based on stocktake figures

		Proportion of serial used over the study period
Serial 1	Milk and milk products	1.30
Serial 2	Meat and meat alternatives	1.00
Serial 3	Eggs fresh	1.00
Serial 4	Bacon rashers	1.00
Serial 5	Potatoes	1.01
Serial 6	Assort fresh fruit and vegetables	1.15
Serial 7	Bread and other cereals	1.11
Serial 8	Table and cooking fats	1.30
Serial 9	Jam assorted	0.93
Serial 10	Sugar white	0.45
Serial 13	Beverages	0.46
Serial 14	Fruit juice	1.01

The apparently excessive consumption of table and cooking fats (Serial 8) was due to unexpectedly high consumption of oil and cream. The excessive use of cream may be a BOI/POI issuing problem and the rate of consumption of oil may have implications for the supplement articles section of SUPMAN 4 (Department of Defence, 1994). Additional oil was also used in this mess for complete replacement of the deep frying media on a weekly basis. This is considered to be an appropriate practice and should be addressed in the supplement articles of SUPMAN 4 (Department of Defence, 1994).

The sugar and beverage (tea, coffee etc.) serials (Serial 10 and Serial 13) were consumed at less than 50% of the entitlement (Table 2). It may be that a reduction is warranted in the quantities of food provided by these serials of the meal-based scales. Under-consumption of these items could also be due to a warm or hot climate and in this situation it would be preferable to substitute cold drinks such as fruit juice and cordial for tea and coffee.

It also became evident during the study that there was a need to allocate an entitlement for canned vegetables to the breakfast scale to allow for the usage of baked beans, canned tomatoes and mushrooms which are used as regular breakfast menu items. Following the trial, an entitlement of 200 g of Vegetables, Canned was added to the breakfast scale (pers. comm. Senior Inspector of Foodstuffs).

Based on stocktake figures the usage of the remaining serials (Serials 2-7, 9, 13 and 14) was very close to the entitlement (Table 2).

However, as shown in Tables 3, 4 and 5, the meal to meal variation was much greater. It is considered that accounting for food usage will need to be over a 28 day period to even out the expected daily fluctuations.

Appendix 6 gives further data on entitlements used within the proposed meal based ration scale on a meal by meal basis.

Table 3: Proportion of breakfast serial items consumed for each breakfast

BREAKFAST		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Weekly average
Serial 1	Milk and milk products	1.98	2.21	0.75	1.45	1.12	0.73	0.92	1.31
Serial 2	Meat and meat alternatives	0	0	0.15	0	0.08	0.08	0.08	0.06
Serial 3	Eggs fresh	1.61	1.21	0.49	1.33	0.82	0.67	1.35	1.07
Serial 4	Bacon rashers	0.86	0.77	0.31	0.77	0.51	0.53	0.4	0.59
Serial 6	Assort fresh fruit and vegetables	1.55	1.76	0.7	0.49	0.63	0.86	1.14	1.02
Serial 7	Bread and other cereals	0.43	0.7	0.43	0.51	0.39	0.42	0.52	0.49
Serial 8	Table and cooking fats	2.85	3.65	1.29	1.22	1.3	2.83	2.25	2.20
Serial 9	Jam assorted	0.68	0.22	0.64	0.87	0.74	0.37	0.31	0.55
Serial 10	Sugar white	0.19	0.24	0.24	0.09	0.08	0.08	0.09	0.14
Serial 13	Beverages	1.11	1.42	0.39	0.34	0.38	0.38	0.61	0.66
Serial 14	Fruit juice	1.0	1.01	1.0	1.0	1.0	1.0	1.01	1.00

Table 4: Proportion of lunch serial items consumed for each lunch

LUNCH		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Weekly average
Serial 1	Milk and milk products	3.26	1.43	0.70	0.96	0.67	2.41	0.00	1.35
Serial 2	Meat and meat alternatives	0.65	0.83	0.63	0.64	0.72	0.74	1.48	0.81
Serial 5	Potatoes	0.63	0.53	0.43	0.44	0.30	0.62	0.06	0.43
Serial 6	Assort fresh fruit and vegetables	1.03	0.83	0.39	0.51	0.88	0.72	0.29	0.66
Serial 7	Bread and other cereals	0.53	1.25	1.25	1.20	1.28	0.83	1.22	1.08
Serial 8	Table and cooking fats	1.52	1.09	0.4	0.59	0.77	1.61	1.04	1.00
Serial 9	Jam assorted	1.52	1.28	0.11	0.23	1.01	0.00	0.00	0.59
Serial 10	Sugar white	0.12	0.11	0.45	0.49	0.54	0.94	0.86	0.50
Serial 13	Beverages	0.64	0.59	0.27	0.28	0.35	0.54	0.68	0.48

Table 5: Proportion of dinner serial items consumed for each dinner

DINNER		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Weekly average
Serial 1	Milk and milk products	0.61	1.18	0.88	1.48	1.18	1.42	1.63	1.20
Serial 2	Meat and meat alternatives	0.45	0.70	0.57	0.78	0.85	0.60	0.73	0.67
Serial 5	Potatoes	0.76	0.58	0.38	0.52	0.48	0.58	0.52	0.54
Serial 6	Assort fresh fruit and vegetables	0.68	0.68	0.58	0.53	0.60	0.96	0.95	0.71
Serial 7	Bread and other cereals	1.23	1.10	1.03	0.83	0.71	1.08	0.89	0.98
Serial 8	Table and cooking fats	1.44	0.99	0.80	0.87	0.79	1.16	2.18	1.18
Serial 9	Jam assorted	1.51	1.33	0.33	0.51	1.56	0.22	0.00	0.78
Serial 10	Sugar white	0.15	0.11	0.33	0.72	0.62	0.63	0.43	0.43
Serial 13	Beverages	0.82	0.60	0.30	0.33	0.41	0.45	0.39	0.47

Table 6 compares the mean energy availability for each meal from the basic meal-based scales with the mean energy made available at the servery during this study. Table 6 also compares the contribution to total energy made by protein fat and carbohydrate from the meal-based scales and from the servery at East Hills ORs Mess.

Table 6: Available energy and the percentage contributions of protein (P), fat (F) and carbohydrate (C) to total energy from the basic items of the meal based ration scale and at the servery

	Energy available from the basic items of the meal-based ration scales *	Energy available at the servery during the study#
Breakfast	5,350 kJ	3,900 kJ
Contribution to energy	P:16 % F:31 % C:52 %	P:17 % F:39 % C:42 %
Lunch	5,660 kJ	5,660 kJ
Contribution to energy	P:20 % F:29 % C:50 %	P:20 % F:40 % C:39 %
Dinner	5,660 kJ	6,260 kJ
Contribution to energy	P:20 % F:29 % C:50 %	P:19 % F:42 % C:38 %
Total for all three meals	16,660	15,820

* see Appendix 7 for full details

see Appendix 8 for full details

The basic items of the proposed meal based ration scale provide 16,660 kJ of energy per day for a soldier attending all three meals. However, within each serial alternative foods can be chosen. This means that a range of energy and nutrient availabilities can result from the use of the meal based scales, depending on which alternative foods are chosen. As shown in Table 6, during this study the mean daily energy available to a diner eating three meals at the mess was 15,820 kJ.

The proportion of energy available in the mess as fat (39% for breakfast, 40% for lunch and 42% for dinner) is considered too high. The National Health and Medical Research Council (Truswell, 1992) recommends that fat should provide only about 30% of energy intake. It is considered that nutrition education is needed for both caterers and soldiers to encourage increased consumption of carbohydrate at the expense of fat. In this regard, DCATR-A Technical Instruction 1/92 'Menu Planning, Cooking and Presentation' (DCATR-A 1992) is seen as an excellent first step in this direction.

It is also true that caterers do not have to draw all the entitlement—if feeding in the field is found to lead to excessive wastage, the quantities of less popular foods presented can be reduced accordingly.

3.3 Food and Nutrient Intake and Wastage

Appendix 8 shows the detailed results for nutritional intake.

Tables 7, 8 and 9 summarise the results for energy and macronutrient availability, wastage (servery and plate waste) and intake for breakfast, lunch and dinner respectively.

Table 7: Mean energy and macronutrient availability, wastage and intake for breakfast per person

	Energy kJ	Protein g	Fat g	Carbohydrate g
Gross available for breakfast	3,903	38.9	41.2	102.8
Breakfast plate waste	128	1.8	1.2	3.1
Breakfast servery waste	214	3.1	3.3	2.3
Net Intake Breakfast (n=523)	3,561	34	36.7	97.4

Table 8: Mean energy and macronutrient availability, wastage and intake for lunch per person

	Energy kJ	Protein g	Fat g	Carbohydrate g
Gross available for lunch	5,658	65	61.5	137.1
Lunch plate waste	237	2.8	2.5	5.8
Lunch servery waste	336	4.0	3.3	8.9
Net Intake Lunch (n=839)	5,085	58.2	55.7	122.4

Table 9: Mean energy and macronutrient availability, wastage and intake for dinner per person

	Energy kJ	Protein g	Fat g	Carbohydrate g
Gross available for dinner	6,261	68.3	71.2	147.8
Dinner plate waste	177	1.6	1.7	5.0
Dinner servery waste	922	12	10.3	20.4
Net Intake Dinner (n=845)	5,162	54.7	59.2	122.4

Forbes-Ewan (1993) concluded that 12,000 kJ per day is the mean requirement of soldiers with relatively sedentary occupations. The actual requirement at the East Hills mess was higher than expected; a large proportion of the diners were not sedentary due to training activities being undertaken. The East Hills ORs Mess has an attendance rate similar to other messes studied previously. It was obvious to the researchers through observation and discussions with the diners, officers and catering staff that conditions for which this mess was chosen for the study were not completely fulfilled, and that the mess could not be considered "typical". In fact a 'typical' Army mess may not exist—each mess may have a mix of activity levels which is unique to that mess.

Many of the soldiers at East Hills were from 4 RAR, which was preparing to become a commando regiment. Part of this preparation included at least two periods of PT daily, and some soldiers were completing three sessions of PT. In addition, a large proportion of soldiers were doing weight training and/or other forms of intensive exercise in their own time as part of their personal fitness programs.

At this study, the sum of the mean intakes for breakfast, lunch and dinner was approximately 13,800 kJ. It is not possible to relate this back to individual diners, because of the 40% to 60% (apparently low, but typical of other messes we have

studied attendance rates) at meals. Despite this caveat, the food availability can not be considered excessive. If we consider any typical diner as attending 55% of available meals, this gives an average food consumption from the mess of only 7,600 kJ or 63% of the requirements for sedentary males. Other food consumed from outside the mess will add considerably to the total food consumed.

From Table 8, prepared food wastage (sum of plate waste and server waste) accounts for 8.7% of the energy made available for breakfast. The corresponding results for lunch and dinner are 10.1% and 17.5% respectively. Taking into account the attendance for each meal, the total wastage was 13.1% of the food energy made available to the soldiers.

Prior to the study, agreement had been reached with Army that it should be possible to restrict wastage of food to no more than 15% of the food made available (Harwood, 1994). A previous study (Waters et al, 1995) had already indicated that wastage levels of approximately 12% of the food made available are achievable. This study confirms that finding. These results suggest that with good kitchen management, wastage of even less than 15% can be achieved.

Even so, some management practices could be improved. For example, some meat cuts purchased were of unsuitable quality, such as topside steak with 25% selvedge fat. Entitlement to meat is according to weight. If this meat is fully trimmed of fat (as recommended by DCATR-A (1992), the quantity of meat available to the diner is reduced by 25% compared to the quantity that would have been available had lean meat been purchased. If the meat is not trimmed, soldiers are being encouraged to eat high fat meats. Inspection of all foods purchased, and rejection of those that are not of suitable quality should be standard practice in all messes.

It had previously been suggested (Waters et al, 1995) that server waste may be reduced by preparing wet dishes and cooked breakfasts (eg scrambled eggs, baked beans) for no more (or perhaps even slightly fewer) than the predicted number of diners. In this way, less food will be wasted if numbers attending are lower than predicted. Short order cooking of foods such as refrigerated meat cuts, bacon and eggs can be used to feed those diners attending in excess of expectation, without adding to food wastage.

Any increased cost of additional short order cooking above that of current practices needs to be compared with any potential cost savings in food.

Information needs to be obtained on food preferences of the clientele to ensure that the foods being offered are not only nutritious but are also acceptable. This can perhaps most readily be obtained in two ways — by seeking feedback from diners and by recording those foods that are most often discarded.

Comment books and references of complaints to mess committees are already used to obtain some feedback from diners. It is considered that more information would be obtained from the use of regular questionnaire-based surveys. DNRC has devised questionnaires that can be used by Army to determine the level of diner satisfaction with the standard of catering in messes. Unpopular foods such as tomato juice, can be deleted (or reduced appropriately) when indents for food are made, while other foods (eg whole pineapples and melons) need to be prepared appropriately for consumption.

Noting the foods that are most commonly discarded, and, most importantly, relaying this information to the authorities responsible for procuring rations, will allow future indents to be made only for foods that are likely to be eaten and allow appropriate substitutions to be made within serials in the proposed new scale.

Evidence from the current study indicates that the catering staff have a good understanding of the food preferences of the diners. This information was not used, as advice to the Ration Clerk on products to be purchased was often not actioned. For example, stocks of yeast extract were exhausted within several days of the dries break, while lemon spread accumulated over successive ration breaks. This was despite repeated requests to the Ration Clerk for purchase of a greater quantity of yeast extract instead of lemon spread. One possible reason for the non purchase may be the inflexibility of the software program used to control food purchases (ArmyFood), so that the Ration Clerk preferred to continue using the same figures every week. A more flexible, user friendly ration procurement system may provide greater opportunity to purchase appropriate foods.

One further suggestion that may help to reduce wastage is the possible use of standard recipes for meal production. On this (and previous) studies it has been observed that cooks rarely consult a recipe when preparing meals. Consequently, the standard of meals varies considerably, depending on the individual preferences and capabilities of each cook. By not following standard recipes the likelihood of failures is increased. Using a card index or computerised system of recipes would reduce the likelihood of failures and should therefore also reduce the number of meals which must be discarded. Computer software is available that will facilitate determination of types and quantities of ingredients required for a specified number of serves of each menu item (when prepared according to the standard recipe). Details on a commercially-available system ('CBORD') have been provided to the Senior Inspector of Foodstuffs. A combination of computerised standard recipes and computerised indenting based on those recipes may improve the efficiency of Army rationing.

Anecdotal evidence and observation indicated that the quantities of some items presented at the serving point, especially vegetables such as peas and beans, were decided on the basis of "filling the bain" rather than any perception of the quantity that would be taken by diners. Presentation is an important aspect of job satisfaction for cooks and is to be encouraged both for the satisfaction of the preparer and the consumer. However, the current practice is wasteful and costly, and may be readily overcome by:

- changes in purchasing practice (buying the more popular vegetables);
- using the less popular vegetables (QF peas, beans, corn kernels and especially mixed vegetables) in stews and casseroles and as reserve items that can be quickly steamed as additional vegetables if diner numbers are greater than expected; and
- use of more appropriately sized bains that match the expected level of consumption.

3.4 Questionnaire Results

The aim of the questionnaires administered on day 6 and day 7 was to determine if diners were unhappy with the quantity of food provided when they were served their

entitlements, compared to the quantity taken *ad libitum*. The results of this survey are not discussed in this report as conditions during the two days of the survey period varied. They are shown at Appendix 9 as they may be of interest to catering staff.

4. Conclusions

As a result of the success of the ABR system in feeding soldiers in this study, ABR was introduced into service throughout Army for field and barracks feeding, from 1 July, 1997. The following conclusions take this into account.

- The energy intake at each meal in the present study was high, but seemed to be consistent with the observed energy expenditure of the diners. It is also very likely that few soldiers were eating three meals from the mess, so the sum of the mean energy intakes from breakfast, lunch and dinner is not considered to be indicative of mean daily intake from the mess.
- There is currently insufficient information available to the Caterer to accurately predict diner numbers at Army messes. Such predictions are essential if ABR is to be a success. Improved communication of ration strength numbers and better historical data on meal attendance are needed to improve the accuracy of predictions of likely diner numbers.
- The meal-based ration scales, revised since this trial to increase availability of milk and canned vegetables (for breakfast) appear to provide adequate food to meet demand at a mixed Army mess.
- Army might consider investigating ways in which deletions of unnecessary food can be enforced, thereby realising the potential for economy in the wording of Chapter 2 of SUPMAN 4 (Department of Defence, 1994). There will be times when deletions will be required to achieve economy of feeding, for example when attendance rates approach 100% for all meals.
- Improved feedback from diners and caterers on food preferences is needed to reduce wastage of food.
- There may be merit in Army using off-the-shelf computer software that combines menus, standard recipes, and ingredients for predicted diner numbers.
- Ration accounting under ABR needs to be over a sufficiently long period to allow for evening out of daily fluctuations in meal attendance.
- It is considered that nutrition education of both Army catering staff and the diners may be needed to overcome the consumption of high fat foods at the expense of those rich in carbohydrate and fibre.
- Approximately 13% of the food made available at the servery was not consumed. This is less than the 15% wastage agreed by Army as being acceptable and achievable. Even so, some purchasing and catering practices were observed that are likely to exacerbate food wastage. Appropriate alterations to purchasing, storage and catering practices, discussed in the body of this report, may assist in reducing wastage and increasing the likelihood that ABR is successful in meeting the nutritional needs and the desires of diners at Army messes.

- There is scope for reducing the quantities of sugar (Serial 9) and beverages (Serial 13).
- The practice of replacing deep frying medium on a weekly basis at East Hills ORs Mess is inconsistent with the wording of SUPMAN 4, which allows replacement only on a fortnightly basis. Weekly replacement is seen as being the more appropriate approach.

5. Acknowledgments

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Appendix 1: Meal Based Ration Scale used at East Hills

GROUP	SERIAL	BASIC AND ALTERNATIVE ITEMS	RATIONING BASIS (g or mL per person)	
			B/Fast	Lunch/Din
Milk and Milk Products	1	MILK WHOLE FRESH	250	200
	1a	Milk Reduced Fat	250	200
	1b	Milk Condensed Unsweetened	110	90
	1c	Milk Condensed Sweetened	50	45
	1d	Milk Whole Dry	35	25
	1e	Milk Whole Sterilised	250	200
	1f	Yoghurt	210	175
	1g	Cheese Block	45	35
	1h	Cheese Canned	-	40
	1i	Ice Cream	-	70
	1j	Ice Cream Mix Dry	-	12
Meat and Meat Alternatives	2	MEAT CUTS BONELESS, TRIMMED OF FAT	50	175
	2a	Beef Carcase - Fresh	75	260
	2b	Mutton Carcase	60	210
	2c	Lamb Carcase	60	210
	2d	Luncheon Sausage	25	90
	2e	Meat, High Energy Pack	40	140
	2f	Meat, Low Energy Pack	50	175
	2g	Beef Dehydrated	15	55
	2h	Beef with Vegetable, Dehydrated	20	70
	2i	Mutton Dehydrated	15	55
	2j	Mutton with Vegetable, Dehydrated	20	70
	2k	Meat Pastes	40	140
	2l	Sausages	30	105
	2m	Salami/Cabana	20	70
	2n	Minced Steak	50	175
	2o	Frankfurts	30	105
	2p	Saveloys	30	105
	2q	Corned Beef	50	175
	2r	Pork Carcase	65	230
	2s	Pork Cuts Boneless	40	160
	2t	Ham Bone-in Cooked	80	280
	2u	Ham Boneless Cooked	55	190
	2v	Ham Canned	65	230

Appendix 1 continued

GROUP	SERIAL	BASIC AND ALTERNATIVE ITEMS	RATIONING BASIS (g or mL per person)	
			<u>B/Fast</u>	<u>Lunch/Din</u>
Eggs Fresh	2w	Pork Dehydrated	20	70
	2x	Poultry Bone-in	-	260
	2y	Poultry Bone-out (eg chicken breast)	-	175
	2z	Turkey, bone-in	-	260
	2aa	Fish Fresh/Frozen Smoked/Gutted - not Trimmed	100	350
	2ab	Fish Fresh/Frozen/ Smoked/Gutted - Trimmed	80	280
	2ac	Fish Fillets	65	230
	2ad	Fish Dehydrated	25	85
	2ae	Fish Canned,	50	175
	2af	Fish Pastes	50	175
	2ag	Tongue Ox	40	140
	2ah	Tongue Sheep	40	140
	2ai	Kidney Ox	65	225
	2aj	Kidney Sheep	65	225
	2ak	Liver Sheep/Lamb	50	175
	2al	Brains Sheep/Lamb	60	210
	2am	Tripe	80	280
	2an	Oxtail	-	315
	2ao	Rabbit Carcase	90	315
	2ap	Veal Carcase	90	315
	2aq	Veal Cuts Boneless	65	230
	2ar	Nuts Various	20	70
	2as	Pulses	-	90
	2at	Soya Beans Fresh	55	200
	2au	Soya Bean Curd	100	350
	2av	Textured Vegetable Protein	25	90v
	2aw	Egg Whole Fresh	-	3 Nos
	2ax	Bacon Rashers	-	85
	2ay	Bacon Sides	-	120
	2az	Bacon Canned	-	85
	3	EGGS FRESH	1 No.	-
	3a	Egg Powder	12	-
	3b	Cheese Block	25	-
	3c	Cheese Canned	25	-
	3d	Fish Canned	50	-

Appendix 1 continued

GROUP	SERIAL	BASIC AND ALTERNATIVE ITEMS	RATIONING BASIS (g or mL per person)	
			<u>B/Fast</u>	<u>Lunch/Din</u>
Bacon Rashers	3e	Meat Cuts	50	-
	4	BACON RASHERS	30	-
	4a	Bacon Sides	45	-
	4b	Bacon Canned	35	-
	4c	Beef Carcase	90	-
	4d	Meat Cuts Boneless	60	-
	4e	Meat High Energy Pack	50	-
	4f	Fish Canned	60	-
	4g	Ham Bone in Cooked	90	-
	4h	Ham Boneless Cooked	65	-
Vegetables and Fruit	4i	Ham Canned	75	-
	4j	Seeds Various	55	-
	5	POTATOES FRESH	-	200
	5a	Potatoes Fresh Peeled	-	135
	5b	Potatoes Canned	-	265
	5c	Potatoes Dehydrated	-	40
	5d	Potatoes Mashed Powder	-	40
	5e	Flour Plain	-	40
	5f	Rice	-	40
	5g	Bread	-	60
	5h	Pasta Dry	-	40
	5i	Noodles	-	40
	6	FRESH FRUIT AND VEG. ASSORTED	200	350
	6a	Fruit Canned	135	235
	6b	Fruit Pie Pulp	-	350
	6c	Fruit Dried	-	40
	6d	Fruit Juice Drink	150	250
	6e	Fruit Juice Powder and sugar	20	36
	6f	Prunes Dessert Moist Pack	-	100
	6g	Vegetables Dehydrated	-	35
	6h	Pulses	-	35
	6i	Vegetables Quick Frozen	-	260
	6j	Vegetables Canned	-	350
	6k	Tomato Paste	-	75
	6l	Tomato Puree	-	225
	6m	Tomato Granules	-	20

Appendix 1 continued

GROUP	SERIAL	BASIC AND ALTERNATIVE ITEMS	RATIONING BASIS (g or mL per person)	
			B/Fast	Lunch/Din
Bread and Other Cereals	7	BREAD	200	175
	7a	Biscuit Survival	100	90
	7b	Flour Plain	140	115
	7c	Bread Mix and	160	140
		Yeast Compressed or	6	5
		Yeast Compound	2.5	2
	7d	Breadmaking Ingredients		
	7e	Potatoes Fresh	720	580
	7f	Rice	140	115
	7g	Crumpets	240	-
	7h	Muffins Plain	200	-
	7i	Biscuits Cracker	100	140
	7j	Biscuits Sweet	100	140
	7k	Fruit Cake	-	105
	7l	Cake making Ingredients		
	7m	Pasta Dry	-	115
	7n	Cornflour	-	115
	7o	Sago	-	115
	7p	Tapioca	-	115
	7q	Oatmeal	130	-
	7r	Breakfast Cereal	130	-
	7s	Semolina	-	115
	7t	Wheatmeal	130	115
	7u	Barley	-	115
	7v	Noodles	-	115
	7w	Ready Prepared Mixes	130	115
	7x	Flour Self Raising	130	115
	7y	Flour Chlorinated /	130	115
		General Cooking		
	7z	Flour Low Protein	130	115
Table and Cooking Fats	8	BUTTER	15	25
	8a	Butter Concentrate	13	20
	8b	Table Margarine	15	25
	8c	Cooking Margarine	15	25
	8d	Cooking Oil	15	25
	8e	Deep Frying Compound	15	25
	8f	Deep Frying Oil	15	25

Appendix 1 continued				
GROUP	SERIAL	BASIC AND ALTERNATIVE ITEMS	RATIONING BASIS (g or mL per person)	
			B/Fast	Lunch/Din
Sugars, Jams and Honey	8g	Cream	-	55
	8h	Ice Cream	-	90
	8i	Ice Cream Mix Dry	-	15
	9	JAM ASSORTED	12	10
	9a	Golden Syrup	11	9
	9b	Honey	10	8
	9c	Vegetable Extract	5	4
	9d	Peanut Spread	5	4
	9e	Fruit Spread	7	6v
	9f	Sugar White	7	6
	10	SUGAR WHITE	30	25
	10a	Sugar Brown	30	25
	10b	Sugar Castor	30	25
	10c	Sugar Icing	30	25
	10d	Jam Assorted	30	25v
	10e	Jelly Crystals	-	25
	10f	Topping	-	50
	11	RESERVED		
	12	RESERVED		
Beverages	13	TEA	3	3
	13a	Coffee Pure Ground	24	24
	13b	Coffee Instant	6	6
	13c	Food Drink Sweetened	32	32
	13d	Cocoa	18	18
	13e	Fruit Juice Cordial	115	115
	13f	Beverage Base Powder	14	14
	14	FRUIT JUICE	90	-
	14a	Fruit Juice Cordial	20	-
	14b	Beverage Base Powder	10	-

Culinary Adjuncts To be obtained from SRA during peacetime

Appendix 2: Report by WO1 P Moran DCATR-A

Report on the Meal Based Ration Trial Conducted at East Hills Barracks 23-29 November 1996

Background:

1. DCATR was requested by the Senior Inspector Foodstuffs (SIF) to assist DSTO and MM LOG Comd in the evaluation of a trial on a meal based ration entitlement over the period 23 - 29 Nov 96 at the East Hills Barracks, Holsworthy, NSW.
2. DSTO provided three scientists to conduct the trial and DCATR allocated the WO1 Tech to assist the scientists and provide advice on catering matters. The WO1 Tech was also to make recommendations on possible options for accounting for the new system.

Problems experienced:

3. Prior to the trial commencing the IF at DNSDC was requested to write a PO1/BO1 according to the new meal scale in the revised SUPMAN 4. The IF encountered many problems with trying to develop a PO1/BO1 on the ARMYFOOD 3 program, for example; due to the change in serials of some items there was not the flexibility to alter FOOD 3, also it was extremely difficult to compile a PO1/BO1 by meal.
4. During the trial it was discovered that the rice and pasta Ent's were too low, this was overcome by reducing the bread Ent and increasing the rice/pasta entitlements.
5. The bacon Ent was discovered to be too low, this turned out to be a transcription error by the IF.
6. The diner forecast was found to be inaccurate, when compared to the actual numbers of diners who consumed the meals. In some cases it was under forecast by 50% (forecast 50, actual 73). This is a major area of concern.

Diner acceptance:

7. The main concern from the diners seems to be whether they will still be able to have what they want, followed by will I have to pay any more for the meal.
8. An education program needs to be implemented to inform diners of what type of nutritionally based meal entitlement they will receive.

Catering staff acceptance:

9. The Catering staff were naturally hesitant and apprehensive on the new system of meal based entitlement, as they did not have an understanding of what would be expected of them.
10. The staff developed a sense of economy and started to gain an appreciation of the wastage created under the old daily entitlement system.

Observations:

11. Milk, bread, sugar, coffee, tea, fruit, cereals and unauthorised meals being removed from the mess by diners.
12. An education program needs to be delivered to all soldiers and commanders on the new entitlement system.
13. It needs to be emphasised at unit level about the importance of timely and correct forecasting.
14. Seafood and croissants should be included on the new meal based entitlement.
15. An evaluation of the suitability of low fat margarines.

Accounting options:

Option One:

16. Develop a 28 day cyclic menu (based on the meal based ration entitlement) that is nutritionally balanced (tested by DSTO and DCATR) using a current in service nutritionist or a consultant.
17. Utilising the current IS technology (Off the shelf/ACMIS/AUSMIS/DEFMIS), develop an accounting system for rationing, linking the Unit IS to computer terminals in ration stores, Supply, local suppliers and Comds.
18. The system should link the forecast or amendment of attendance of entitled (DR) and non entitled diners (FFR) at meals, as well as having the ability to book accommodation. The operator at the ration store be able to input ration demands to supply or direct to suppliers and then acquitting back to supply and Unit/Comds based on actual consumption. A diagrammatic layout is at attachment 1.
19. Provide an individual swipe card linked to direct debit of pay for all personnel (ID card). Also provide a Unit swipe card which has been programmed with the authorised entitlement to FFR.

Option Two:

20. Develop a 28 day cyclic menu (based on the meal based ration entitlement) that is nutritionally balanced (tested by DSTO and DCATR) using a current in service nutritionist or a consultant.
21. Develop a mix of IS and a paper work accounting system based on above model.

Option Three:

22. Develop a paper work accounting system based on above model.

Option Four:

23. Develop and implement the meal based entitlement system and re-evaluate current methods of accounting for suitability.

Recommendations:

24. Evaluate the current RAN and RAAF Catering systems for suitability to meet the Army's needs.
25. Evaluate the ration systems currently used by ABCA Defence Forces for suitability to meet Australia's needs.
26. Develop and implement an education program to inform diners and Catr staff of what type of nutritionally based meal entitlement they will receive.
27. Develop and implement option one.
28. Develop and implement option two.
29. Develop and implement option three.
30. Develop and implement option four.
31. Each of the above systems will require much research and development, however if a quick fix solution is required, may I suggest that funds be procured to purchase off the shelf menu/recipe, accommodation and kitchen management software systems. To provide sufficient flexibility to local commanders, those software catering management systems should be developed to meet the local rather than national needs.

LAYOUT OF OPTION ONE
MEAL BASED ENTITLEMENT ACQUITTAL PROCESS

Unit Bid to Comds for DR/FFR (entered on IS)

Approved DR/FFR activities entered as forecast on IS
(OPSO/ AO receive programmed swipe card indicating approved forecast of FFR)

Ration/ Accn forecast info downloaded to Catr Mngr (IS)

Dining strength forecasted by (meal/mess) 7 and 3 day in advance (IS)

Roll Book marked (PI Staff)

Roll Book data entered into IS (Unit Ord Room Staff)

Daily forecast of Accn/Diners (by meal/mess)
downloaded to Catr Mng (including forecast amendment) using IS

Stocktake of food commodities (entered on IS)

Meal items requested using a menu based ordering system and taking into account
items held on stock (IS entered)

Commodities received/checked/issued

Commodities cooked/consumed

IN MESS
individuals pay by swipe card

TAKE AWAY
OPSO/ AO pay by Unit swipe card

Meals consumed are accounted by swipe card (pay as you eat)

Accounted through IS to Unit, Supply and Comd

Appendix 3 : BOI/POI for Meal Based Scale used at EastHills Barracks

SERIAL	Entitlement		Day 1		Day 2		Day 3		Day 4		Day 5		Day 6		Day 7	
	B'Fast	L/D	B'Fast	L/D	B'Fast	L/D	B'Fast	L/D	B'Fast	L/D	B'Fast	L/D	B'Fast	L/D	B'Fast	L/D
Milk Bulk	250.00	200.00	250.00	114.50	250.00	114.50	250.00	162.50	250.00	112.10	250.00	114.50	250.00	161.10	250.00	114.50
Milk CUS	110.00	90.00						13.00								
Milk CS	50.00	45.00														
Milk DFC	35.00	25.00														
Cheese	30.00	35.00		1.50		1.50		1.50		5.50				3.80		1.50
Ice Cream		70.00		27.00		27.00				1.50		1.50		1.50		27.00
TOTAL			1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Beef Carc	75.00	260.00	52.50	140.00	75.00	142.00	100.00		40.00	152.00	30.00	105.00	25.00	162.00	75.00	126.00
Fish fill	65.00	230.00	10.00	35.00						30.00						
Fish Cnd	50.00	175.00														
Veal	65.00	230.00					18.00									35.00
Lamb C	60.00	210.00				39.00										20.00
Luncheon	25.00	90.00					11.00			11.00	15.00	10.00		17.50		10.00
Ham B/O	55.00	190.00	8.00	26.00					14.00	30.00			20.00			
Sausages	30.00	105.00														
C/Beef	50.00	175.00				17.00								20.00		
Pork Cuts	40.00	230.00					19.00									37.00
Poultry		260.00		45.00		45.00						45.00		45.00		
Eggs		165.00					27.50									
Bacon		85.00										15.00				
TOTAL			1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Appendix 3 continued

[illegible]

Appendix 3 continued

SERIAL	Entitlement		Day 1		Day 2		Day 3		Day 4		Day 5		Day 6		Day 7	
			70.00	72.00	70.00	60.00	70.00	73.00	61.00	65.00	70.00	70.00	70.00	60.00	72.00	65.00
Bread Fr	200.00	175.00	18.00	15.00	15.00	14.00	18.00	14.00	17.00	15.00	14.00	14.00	14.00	15.00	17.00	16.00
Flour Pl	140.00	115.00	18.00	30.00	18.00	30.00	18.00	30.00	18.00	30.00	18.00	18.00	18.00	30.00	18.00	30.00
Rice	140.00	115.00		12.00		40.00	12.00		10.00	12.00				12.00		40.00
Potatoes	720.00	580.00														
Bisc Crac	100.00	140.00														
Bisc Sw	100.00	140.00														
Pasta Dry				15.50		21.00	10.00			5.00	15.00		15.00	12.00		13.50
Cornflour						2.50	7.50							13.00		
B'Fast Cer	130.00	115.00	30.00		30.00		30.00		30.00		30.00	30.00	30.00		30.00	
Prep Mix	130.00	115.00	5.00	5.00	5.00		3.00		15.00	10.00	5.00	5.00	5.00	5.00	5.00	5.00
Crumpet	240.00		30.00		30.00		30.00								30.00	
Muffin	200.00															
TOTAL			1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Butter	15.00	25.00	5.00	7.00	5.00	7.00	5.00	7.00	5.00	7.00	5.00	5.00	5.00	7.00	5.00	7.00
Marg Tabl	15.00	25.00	5.00	7.00	5.00	7.00	5.00	7.00	5.00	7.00	5.00	5.00	5.00	7.00	5.00	7.00
Pastry Ma	15.00	25.00	2.00	3.00	2.00	3.00	2.00	3.00	2.00	3.00	2.00	2.00	2.00	3.00	2.00	3.00
Cake Mar	15.00	25.00			2.00	3.00			2.00	3.00			2.00	3.00		
Cream	0.00	55.00		4.50		4.50	4.50									4.50
Deep Fry	15.00	25.00	3.00	6.00	3.00	6.00	3.00	6.00	3.00	8.00	3.00	3.00	3.00	8.00	3.00	6.00
TOTAL			1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Appendix 4: Questionnaires

QUESTIONNAIRE ON BREAKFAST FOR 28 NOVEMBER AT EAST HILLS MESS

The Army is trying to devise a new system of rationing that meets your nutritional requirements, satisfies your taste in food and, at the same time, reduces wastage of food to a minimum. The new system is being trialed in the mess this week

This is your opportunity to contribute to the process by giving your opinion on the quality and quantity of food available in the mess during the trial. Remember that the answers you give will influence the food you receive in the future.

Over the next two days you will have the opportunity to comment on several meals. In this questionnaire, we would like to know your opinion of today's breakfast. Please do not write your name on this questionnaire; we do not need to know who you are, only what you thought of the breakfast today.

QUESTIONS

The following questions refer only to TODAY'S breakfast - not to breakfasts generally in the mess.

1. Were you satisfied with the quantity of bread, muffins and crumpets available to today's breakfast?

YES / NO (Please circle your answer)

2. Would you like to have croissants available in addition to bread, muffins and crumpets.

YES / NO

3. Was there enough breakfast cereal this morning?

YES / NO

4. Was the variety of breakfast cereals satisfactory?

YES / NO

5. If your answer to Question 3 was NO, what additional cereals would you like to have available at breakfast?

EXTRA CEREALS:.....

6. (This question applies only if you ate bacon). Were you satisfied with the amount of bacon you were allowed to take this morning?

YES / NO

7. If your answer to Question 6 was NO, how important is this to you (Circle your answer):

VERY IMPORTANT

FAIRLY IMPORTANT

NOT IMPORTANT

8. (This question applies only if you ate eggs for breakfast). Were you satisfied with the amount of eggs you were able to take this morning?

YES / NO

9. If your answer to Question 8 was NO, how important is to you to be able to have more eggs? (Circle your answer).

VERY IMPORTANT

FAIRLY IMPORTANT

NOT IMPORTANT

10. Were you able to obtain enough milk for your needs at breakfast this morning?

YES / NO

11. Were you satisfied with the range of other hot foods on the point (baked beans, tomatoes, mushrooms, pancakes)?

YES / NO

12. If your answer to Question 11 was NO, what other foods would you like to see added to the range of hot foods? (Tick all you agree with)

- INCLUDE CREAMED SWEET CORN

ADD SAUSAGES

INCLUDE GRILLED STEAK

ADD SPAGHETTI
- ☐

☐

☐

☐

OTHER (Please specify):.....

13. Were you satisfied with the range of spreads available (honey, jam etc)?
YES / NO

14. If your answer to Question 13 was NO, what additional spreads would you like? (Please specify):
.....

If you have any other constructive comments you would like to make about breakfast this morning, please write them here:
COMMENTS:

Thank you for taking the time to complete this questionnaire. Your opinion is valuable to us and we appreciate your contribution to improving Army rationing.

QUESTIONNAIRE ON BREAKFAST FOR 29 NOVEMBER AT EAST HILLS MESS

PLEASE NOTE: *You may have filled in a questionnaire for yesterday's breakfast. Some changes have occurred today, so even if you filled in a questionnaire yesterday we would like you to complete this one as well.*

The Army is trying to devise a new system of rationing that meets your nutritional requirements, satisfies your taste in food and, at the same time, reduces wastage of food to a minimum. The new system is being trialed in the mess this week. Please do not write your name on this questionnaire; we do not need to know who you are, only what you thought of the breakfast you ate at the mess this morning.

This is your opportunity to contribute to the process of improving Army feeding by giving your opinion on the quality and quantity of food available in the mess. Remember that the answers you give will influence the food you receive in the future.

QUESTIONS

The following questions refer only to the breakfast you had TODAY - not to breakfasts generally in the mess.

1. Were you satisfied with the quantity of bread, muffins and crumpets available at today's breakfast?
YES / NO (please circle your answer)

2. Would you like to have croissants available in addition to bread, muffins and crumpets?
YES / NO

3. Was there enough breakfast cereal this morning? YES / NO

4. Was the variety of breakfast cereals satisfactory? YES / NO

5. If your answer to Question 4 was NO, what additional cereals would you like to have available at breakfast?

EXTRA CEREALS:

6. (This question applies only if you ate bacon). Were you satisfied with the amount of bacon you were allowed to take this morning?
YES / NO

7. If your answer to Question 6 was NO, how important is it to you to be able to take more bacon? (Circle your answer):

VERY IMPORTANT

FAIRLY IMPORTANT

NOT IMPORTANT

8. (This question applies only if you ate eggs for breakfast). Were you satisfied with the amount of eggs you were able to take this morning?
YES / NO

9. If your answer to Question 8 was NO, how important is it to you to be able to have more eggs? (Circle your answer).

VERY IMPORTANT

FAIRLY IMPORTANT

NOT IMPORTANT

10. Were you able to obtain enough milk for your needs at breakfast this morning?
YES / NO

11. Were you satisfied with the range of other hot foods on the point (baked beans, tomatoes, mushrooms, pancakes)?
YES / NO

12. If your answer to Question 11 was NO, what other foods would you like to see added to the range of hot foods? (Tick all you agree with)

- | | |
|----------------------------|-----|
| INCLUDE CREAMED SWEET CORN | [] |
| ADD SAUSAGES | [] |
| INCLUDE GRILLED STEAK | [] |
| ADD SPAGHETTI | [] |

OTHER (please specify).....

13. Were you satisfied with the range of spreads available (honey, jam etc)?
YES / NO

14. If your answer to Question 13 was NO, what additional spreads would you like? (Please specify):
.....

If you have any other constructive comments you would like to make about breakfast this morning please write them below.

COMMENTS:.....

Thank you for taking the time to complete this questionnaire. Your opinion is valuable to us and we appreciate your contribution to improving Army rationing.

QUESTIONNAIRE FOR DINNER ON 28 NOVEMBER AT EAST HILLS MESS

A study is being conducted this week of a new system of determining entitlements to rations. The aim of this system is to meet the soldier's nutritional requirements, satisfy his/her taste in food and reduce food wastage to a minimum.

Currently, ration entitlement is according to the number of soldiers on ration strength and food may be drawn regardless of the number who actually attend meals. Under the revised system, entitlement to food is according to meal attendance not according to ration strength. This is the system that is being trialed.

We need to know what you think of the quantity and types of food that are provided under the new system. Your input will be of great value, because the ultimate success or failure of any feeding system is determined by how satisfied the customer is. This questionnaire seeks your opinion of tonight's dinner and of dining in the mess generally.

QUESTIONS

To answer the following questions, please place a circle around the answer you agree with.

1. For the following foods, please give your opinion of the range, quality and quantity of food you were able to have at tonight's dinner:

VEGETABLES

RANGE:	ADEQUATE	INADEQUATE		
QUALITY:	POOR	FAIR	GOOD	VERY GOOD
QUANTITY:	ENOUGH		NOT ENOUGH	

DESSERTS

RANGE:	ADEQUATE	INADEQUATE		
QUALITY:	POOR	FAIR	GOOD	VERY GOOD
QUANTITY:	ENOUGH		NOT ENOUGH	

MAIN COURSES

RANGE:	ADEQUATE	INADEQUATE		
QUALITY:	POOR	FAIR	GOOD	VERY GOOD
QUANTITY:	ENOUGH		NOT ENOUGH	

2. If you answered NOT ENOUGH for the quantity of main course, how severely did this affect your enjoyment of the meal:

NOT MUCH MODERATELY GREATLY

3. Was there adequate bread for your needs tonight? YES / NO

4. Was there adequate milk? YES / NO

The following questions refer to dining in the mess generally.

5. For the main courses only, would you prefer to serve yourself or have a cook place the main course on your plate?

COOK SERVE SELF

6. Would you generally prefer to take your meal from the servery (precooked) or have it cooked to order when you arrive?

7. Is there enough pasta served in the mess? YES / NO

8. Is there enough rice? YES / NO

9. Is food cooked in fat too often for your taste? YES / NO

10. Would you like to have access to reduced fat milk as well as whole milk?

YES / NO

Are there any other comments you would like to make about tonight's dinner or any other aspects of dining in the mess generally?

COMMENTS:.....

Thank you for taking the time to complete this questionnaire. Your answers will help to ensure that Army feeding is not only effective but also efficient.

QUESTIONNAIRE FOR DINNER ON 29 NOVEMBER AT
EAST HILLS MESS

NOTE: You may have completed a questionnaire at the mess last night. If so, we would still like you to complete this questionnaire - some changes have occurred with tonight's meal. You may choose to skip questions 5-9 if you answered them in yesterday's questionnaire.

A study is being conducted this week of a new system of determining entitlements to rations. The aim of this system is to meet the soldier's nutritional requirements, satisfy his/her taste in food and reduce food wastage to a minimum.

Currently, ration entitlement is according to the number of soldiers on ration strength and food may be drawn regardless of the number who actually attend meals. Under the revised system, entitlement to food is according to meal attendance not according to ration strength.

We need to know what you think of the quantity and types of food that are provided under the new system. Your input will be of great value, because the ultimate success or failure of any feeding system is determined by how satisfied the customer is.

QUESTIONS

To answer the following questions, please place a circle around the answer you agree with.

1. For the following foods, please give your opinion of the range, quality and quantity of food your were able to have at tonight's dinner:

VEGETABLES				
RANGE:	ADEQUATE	INADEQUATE		
QUALITY:	POOR	FAIR	GOOD	VERY GOOD
QUANTITY:	ENOUGH	NOT ENOUGH		
DESSERTS				
RANGE:	ADEQUATE	INADEQUATE		
QUALITY:	POOR	FAIR	GOOD	VERY GOOD
QUANTITY:	ENOUGH	NOT ENOUGH		
MAIN COURSES				
RANGE:	ADEQUATE	INADEQUATE		
QUALITY:	POOR	FAIR	GOOD	VERY GOOD
QUANTITY:	ENOUGH	NOT ENOUGH		

2. If you answered NOT ENOUGH for the quantity of main course, how severely did this affect your enjoyment of the meal:

NOT MUCH	MODERATELY	GREATLY
----------	------------	---------

3. Was there adequate bread for your needs tonight? YES / NO

4. Was there adequate milk? YES / NO

The following questions refer to dining in the mess generally.

5. For the main courses only, would you prefer to serve yourself or have a cook place the main course on your plate?

COOK	SERVE SELF
------	------------

6. Would you generally prefer to take your meal form the servery (precooked) or have it cooked to order when you arrive?

7. Is there enough pasta served in the mess? YES / NO

8. Is there enough rice? YES / NO

9. Is food cooked in fat too often for your taste? YES / NO

10. Would you like to have access to reduced fat milk as well as whole milk?

YES / NO

Are there any other comments your would like to make about tonight's dinner or any other aspects of dining in the mess generally.

COMMENTS:.....

Thank you for taking the time to complete this questionnaire. Your answers will help to ensure that Army feeding is not only effective but also efficient.

Appendix 5: Proportions of Entitlements to Each Serial in the Meal-Based Scales Used Over the Study Period

SERIAL	Total Actual entitlement (kg)	Total consumed (kg)	Proportion of serial used	Amount used/scale * diners (BOI/POI)
Milk Bulk	349.4506	479.296	1.37	1.03
Milk CUS	4.641	5.25	1.13	0.03
Milk CS	1.848	2.4	1.30	0.02
Milk DFC	0.779	0	0.00	0.00
Cheese BL	2.526	5	1.98	0.06
Ice Cream	27.606	19	0.69	0.16
Total	386.8506	510.946	1.30	1.30
Beef	243.9075	159.454	0.65	0.33
Fish Fillets	15.425	11.72	0.76	0.03
Fish CND	2.68	0.35	0.13	0.00
Veal	13.636	20.5	1.50	0.04
Lamb Carcase	15.613	26.6	1.70	0.07
Luncheon	13.788	8.296	0.60	0.05
Ham B/O	17.6615	14.48	0.82	0.04
Sausages	3.288	20.052	6.10	0.10
C/Beef	7.007	0	0.00	0.00
Pork Carcase	14.445	25.582	1.77	0.06
Poultry	51.39	57.177	1.11	0.13
Eggs	9.8175	30.635	3.12	0.11
Bacon	4.02	4.3	1.07	0.03
Total	412.6785	350.195925	1.00	1.00
Eggs	523	523	1.00	1.00
Bacon	15.69	15.7	1.00	1.00
Potatoes	310.655	320	1.03	0.95
Potatoes CND	10.72	4.92	0.46	0.01
Potatoes DEHY	3.621	3	0.83	0.04
Total	324.996	327.92	1.01	1.01

Appendix 5 continued**PROPORTIONS OF SERIALS USED OVER STUDY PERIOD**

SERIAL	Total Actual entitlement (kg)	Total consumed (kg)	Proportion of serial used	Amount used/scale * diners (BOI/POI)
Fruit Fresh	116.827	165.4	1.42	0.24
Fruit CND	17.2836	17.48	1.01	0.04
Apple pie	16.405	11.4	0.69	0.02
Fruit Dried	1.838	1	0.54	0.01
F/Juice	61.55	17	0.28	0.03
Vegies Fresh	267.901	345.7	1.29	0.50
Vegies CND	69.838	48.955	0.70	0.08
Vegies QF	57.256	72.5	1.27	0.17
Tomato Paste	4.2	7	1.67	0.06
Total	613.0986	686.435	1.15	1.15
Bread Fresh	148.589	171.588	1.15	0.43
Crumpets	6	7.2	1.20	0.06
Muffins	3.84	8	2.08	0.08
Flour Plain	33.064	40	1.21	0.15
Rice	59.934	13.32	0.22	0.05
Potatoes	34.784	50	1.44	0.04
Biscuits	5.052	0.5	0.10	0.00
Cracker				
Biscuits Sweet	3.855	4.5	1.17	0.02
Pasta Dry	20.4925	15.4	0.75	0.08
Cornflour	3.105	1.05	0.34	0.01
Bfst Cereal	15.69	12.415	0.79	0.18
Prep Mixes	12.166	6.1	0.50	0.02
Total	346.5715	330.073	1.11	1.11
Butter	14.403	15.5	1.08	0.31
Margerine	14.403	16	1.11	0.32
Past Marg	3.506	0.5	0.14	0.01
Cake Marg	2.592	0	0.00	0.00
Deep fry oil	13.291	18	1.35	0.36
Cream	3.9375	9.3	2.36	0.10
Total	52.1325	59.3	1.10	1.10

Appendix 5 continued**PROPORTIONS OF SERIALS USED OVER STUDY PERIOD CONT.**

SERIAL	Total Actual entitlement (kg)	Total consumed (kg)	Proportion of serial used	Amount used/scale * diners (BOI/POI)
Jam Asst	5.6835	4.5	0.79	0.19
Gold syrup	0.3246	0.5	1.54	0.02
Honey	5.9476	5	0.84	0.27
Vegetable extrct	0.8524	0.705	0.83	0.08
Peanut Sprd	1.7042	2.625	1.54	0.28
Lemon Sprd	0.5673	0.43	0.76	0.03
Cheese Sprd	1.9805	1	0.50	0.05
Total	17.0601	14.76	0.93	0.93
Sugar White	29.13	5	0.17	0.09
Sugar Brown	4.866	13	2.67	0.22
Sugar Castor	4.469	2.5	0.56	0.04
Sugar Icing	5.628	1	0.18	0.02
Jelly Crystals	9.772	1.2	0.12	0.03
Topping	7.85	3.9	0.50	0.05
Total	61.715	26.6	0.45	0.45
Tea Bags	2.207	1.2	0.54	0.18
Coffee inst	4.414	0.5	0.11	0.04
Drinking choc	3.612	0	0.00	0.00
Milo	7.602	0.75	0.10	0.01
Cordial	36.4155	59	1.62	0.23
Total	54.2505	61.45	0.46	0.46
Fruit Juice	23.535	25	1.06	0.53
Cordial	5.23	5	0.96	0.48
Total	28.765	30	1.01	1.01

Appendix 6: Entitlements used on a Meal by Meal Basis

BREAKFAST

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Weekly average
SERIAL 1								
Milk	1.98	2.08	0.75	1.41	0.91	0.66	0.92	
Milk (flavoured)	0	0.11	0	0	0.04	0	0	
Skim milk	0	0.02	0	0	0	0.05	0	
Yoghurt	0	0	0	0.04	0.17	0.02	0	
TOTAL SERIAL 1	1.98	2.21	0.75	1.45	1.12	0.73	0.92	1.31
SERIAL 2								
Beef	0	0	0.15	0	0.08	0.08	0.08	0.06
SERIAL 3								
Egg	1.61	1.21	0.49	1.33	0.82	0.67	1.35	1.07
SERIAL 4								
Bacon	0.86	0.77	0.31	0.77	0.51	0.53	0.4	0.59
SERIAL 6								
Fresh fruit	0.92	1.14	0.41	0.33	0.35	0.49	0.68	
Fruit Juice	0.16	0.2	0.07	0.07	0.07	0.07	0.1	
Fresh vegies	0	0	0.05	0	0.03	0.03	0.01	
Canned vegies	0.47	0.42	0.17	0.09	0.18	0.27	0.35	
TOTAL SERIAL 6	1.55	1.76	0.7	0.49	0.63	0.86	1.14	1.02
SERIAL 7								
Mixed loaves	0.12	0.29	0.16	0.3	0.23	0.11	0.22	
Flour	0	0.09	0.04	0	0.01	0.05	0.05	
Crumpets	0.06	0	0.04	0.04	0	0.05	0.02	
Muffins	0.1	0.12	0.07	0.06	0	0.04	0.08	
Mixed cereals	0.15	0.2	0.12	0.11	0.15	0.17	0.15	
TOTAL SERIAL 7	0.43	0.7	0.43	0.51	0.39	0.42	0.52	0.49
SERIAL 8								
Butter	0.81	1.01	0.36	0.33	0.35	0.36	0.5	
Margarine	0.65	0.91	0.31	0.33	0.35	1.86	0.9	
Deep frying oil	1.39	1.73	0.62	0.56	0.6	0.61	0.85	
TOTAL SERIAL 8	2.85	3.65	1.29	1.22	1.3	2.83	2.25	2.20

Appendix 6 continued
BREAKFAST

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Weekly average
SERIAL 9								
Jam	0.02	0.01	0.16	0.33	0.53	0.09	0.12	
Honey	0.37	0.15	0.19	0.15	0.21	0.11	0.15	
Cheese Spread	0	0	0	0	0	0.03	0.04	
Vegemite	0.05	0.06	0.24	0.1	0	0	0	
Peanut Butter	0.24	0	0.05	0.29	0	0.02	0	
Lemon Spread	0	0	0	0	0	0.12	0	
TOTAL SERIAL 9	0.68	0.22	0.64	0.87	0.74	0.37	0.31	0.55
SERIAL 10								
Sugar white	0.19	0.24	0.09	0.08	0.08	0.09	0.12	
Sugar brown	0	0	0	0	0	0	0	
Sugar castor	0	0	0	0	0	0	0	
Sugar icing	0	0	0	0	0	0	0	
TOTAL SERIAL 10	0.19	0.24	0.09	0.08	0.08	0.09	0.12	0.13
SERIAL 13								
Tea	0.46	0.58	0.21	0.19	0.2	0.2	0.28	
Coffee instant	0.1	0.12	0.04	0.04	0.04	0.04	0.06	
Milo	0.03	0.03	0.01	0.01	0.01	0.01	0.02	
Drinking chocolate	0	0	0	0	0	0	0	
Cordial	0.52	0.69	0.13	0.1	0.13	0.13	0.25	
TOTAL SERIAL 13	1.11	1.42	0.39	0.34	0.38	0.38	0.61	0.66
SERIAL 14								
Juice	0.27	0.34	0.12	0.11	0.12	0.12	0.17	
Cordial	0.73	0.67	0.88	0.89	0.88	0.88	0.84	
TOTAL SERIAL 14	1	1.01	1	1	1	1	1.01	1.00

Appendix 6 continued
LUNCH

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Weekly average
SERIAL 1								
Milk	1.40	1.33	0.57	0.29	0.46	2.19	0.00	
Milk (flavoured)	1.11	0.00	0.00	0.24	0.00	0.00	0.00	
Skim milk	0.24	0.00	0.00	0.00	0.00	0.00	0.00	
Milk CUS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Milk CS	0.00	0.00	0.00	0.01	0.01	0.00	0.00	
Yoghurt	0.52	0.01	0.00	0.13	0.14	0.04	0.00	
Cheese BL	0.00	0.00	0.13	0.12	0.00	0.16	0.00	
Ice Cream	0.00	0.08	0.00	0.16	0.06	0.01	0.00	
TOTAL SERIAL 1	3.26	1.43	0.70	0.96	0.67	2.41	0.00	1.35
SERIAL 2								
Beef	0.45	0.21	0.12	0.20	0.31	0.18	0.93	
Lamb	0.00	0.09	0.00	0.06	0.06	0.00	0.00	
Luncheon	0.00	0.00	0.07	0.05	0.00	0.14	0.00	
Sausages	0.00	0.00	0.27	0.12	0.00	0.14	0.38	
Pork cuts	0.00	0.00	0.00	0.00	0.00	0.00	0.03	
Ham B/O	0.00	0.00	0.00	0.01	0.00	0.05	0.00	
Poultry	0.04	0.25	0.00	0.10	0.16	0.00	0.01	
Fish fillets	0.00	0.27	0.07	0.00	0.00	0.14	0.12	
Fish CND	0.00	0.00	0.00	0.00	0.00	0.02	0.00	
Veal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Eggs(g)	0.14	0.00	0.08	0.08	0.19	0.03	0.00	
Bacon	0.02	0.00	0.03	0.01	0.00	0.04	0.00	
TOTAL SERIAL 2	0.65	0.83	0.63	0.64	0.72	0.74	1.48	0.81
SERIAL 5								
Potatoes	0.63	0.53	0.43	0.44	0.30	0.62	0.06	
Potatoes CND	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Potatoes DEHYD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
TOTAL SERIAL 5	0.63	0.53	0.43	0.44	0.30	0.62	0.06	0.43

Appendix 6 continued**LUNCH**

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Weekly average
SERIAL 6								
Fresh fruit	0.33	0.25	0.11	0.11	0.13	0.21	0.17	
Fruit CND	0.04	0.02	0.00	0.02	0.05	0.02	0.00	
Fruit app pie	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Fruit Dried	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Fruit Juice	0.13	0.09	0.05	0.05	0.06	0.07	0.06	
Fresh Vegies	0.25	0.33	0.22	0.21	0.36	0.29	0.06	
Vegies Frozen	0.08	0.09	0.00	0.13	0.25	0.09	0.00	
Vegies CND	0.11	0.05	0.01	0.00	0.02	0.03	0.00	
Tomato Paste	0.09	0.00	0.00	0.00	0.00	0.02	0.00	
TOTAL SERIAL 6	1.03	0.83	0.39	0.51	0.88	0.72	0.29	0.66
SERIAL 7								
Mixed loaves	0.47	0.22	0.58	0.37	0.19	0.61	0.79	
Flour plain	0.07	0.08	0.10	0.11	0.15	0.22	0.00	
Potatoes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Rice	0.00	0.77	0.25	0.18	0.33	0.00	0.03	
Biscuits Cracker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Biscuits Sweet	0.00	0.00	0.10	0.00	0.00	0.00	0.00	
Pasta Dry	0.69	0.00	0.00	0.14	0.00	0.23	0.08	
Cornflour	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mixed cereals	0.00	0.03	0.00	0.00	0.01	0.01	0.00	
Prep mixes	0.00	0.00	0.00	0.04	0.03	0.01	0.00	
TOTAL SERIAL 7	1.23	1.10	1.03	0.83	0.71	1.08	0.89	0.98
SERIAL 8								
Butter	0.32	0.24	0.13	0.17	0.36	0.45	0.17	
Margarine	0.39	0.26	0.07	0.13	0.05	0.07	0.61	
Oil	0.55	0.40	0.20	0.22	0.28	0.31	0.26	
Cream	0.26	0.19	0.00	0.07	0.09	0.78	0.00	
TOTAL SERIAL 8	1.52	1.09	0.40	0.59	0.77	1.61	1.04	1.00
SERIAL 9								
Jam	0.00	0.00	0.18	0.26	0.00	0.00	0.00	
Golden syrup	0.00	0.00	0.00	0.04	0.03	0.00	0.00	
Honey	0.00	0.03	0.05	0.00	0.00	0.22	0.00	
Vegemite	0.00	0.00	0.02	0.08	0.02	0.00	0.00	
Peanut Butter	1.51	1.10	0.04	0.04	1.51	0.00	0.00	
Lemon Spread	0.00	0.20	0.03	0.09	0.00	0.00	0.00	
Cheese spread	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
TOTAL SERIAL 9	1.51	1.33	0.33	0.51	1.56	0.22	0.00	0.78

Appendix 6 continued**LUNCH**

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Weekly average
SERIAL 10								
Sugar White	0.15	0.11	0.06	0.06	0.08	0.09	0.07	
Sugar Brown	0.00	0.00	0.26	0.48	0.46	0.41	0.34	
Sugar Castor	0.00	0.00	0.01	0.10	0.05	0.09	0.02	
Sugar icing	0.00	0.00	0.00	0.04	0.02	0.04	0.00	
Jelly crystals	0.00	0.00	0.00	0.03	0.02	0.00	0.00	
Topping	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
TOTAL SERIAL 10	0.15	0.11	0.33	0.72	0.62	0.63	0.43	0.43
SERIAL 13								
Tea	0.31	0.22	0.11	0.12	0.15	0.17	0.15	
Coffee instant	0.06	0.05	0.02	0.03	0.03	0.04	0.03	
Milo	0.02	0.01	0.01	0.01	0.01	0.01	0.01	
Drinking choc.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Cordial	0.43	0.31	0.15	0.17	0.21	0.24	0.20	
TOTAL SERIAL 13	0.82	0.60	0.30	0.33	0.41	0.45	0.39	0.47

Appendix 6 continued**DINNER**

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Weekly average
SERIAL 1								
Milk	0.37	1.04	0.34	0.78	0.71	0.82	1.54	
Milk (flavoured)	0.04	0.00	0.00	0.20	0.00	0.00	0.00	
Skim milk	0.08	0.03	0.03	0.25	0.00	0.23	0.04	
Milk CUS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Milk CS	0.00	0.00	0.00	0.00	0.01	0.00	0.00	
Yoghurt	0.13	0.03	0.02	0.02	0.01	0.06	0.05	
Cheese BL	0.00	0.00	0.02	0.00	0.00	0.00	0.00	
Ice Cream	0.00	0.08	0.46	0.24	0.46	0.31	0.00	
TOTAL SERIAL 1	0.61	1.18	0.88	1.48	1.18	1.42	1.63	1.20
SERIAL 2								
Beef	0.42	0.30	0.33	0.21	0.18	0.33	0.22	
Lamb	0.01	0.00	0.00	0.06	0.17	0.00	0.02	
Luncheon	0.00	0.00	0.00	0.00	0.00	0.00	0.02	
Sausages	0.00	0.00	0.13	0.34	0.00	0.04	0.00	
Pork cuts	0.00	0.21	0.00	0.00	0.00	0.00	0.16	
Ham B/O	0.00	0.00	0.00	0.00	0.16	0.02	0.10	
Poultry	0.02	0.19	0.03	0.07	0.12	0.14	0.13	
Fish fillets	0.00	0.00	0.00	0.00	0.09	0.00	0.00	
Fish CND	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Veal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Eggs(g)	0.00	0.00	0.06	0.05	0.03	0.05	0.04	
Bacon	0.00	0.00	0.01	0.05	0.10	0.00	0.03	
TOTAL SERIAL 2	0.45	0.70	0.57	0.78	0.85	0.60	0.73	0.67
SERIAL 5								
Potatoes	0.76	0.58	0.38	0.52	0.48	0.58	0.52	
Potatoes CND	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Potatoes DEHYD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
TOTAL SERIAL 5	0.76	0.58	0.38	0.52	0.48	0.58	0.52	0.54

Appendix 6 continued**DINNER**

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Weekly average
SERIAL 6								
Fresh fruit	0.24	0.23	0.10	0.09	0.11	0.23	0.29	
Fruit CND	0.00	0.00	0.03	0.02	0.01	0.00	0.05	
Fruit app pie	0.00	0.02	0.00	0.00	0.00	0.00	0.00	
Fruit Dried	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Fruit Juice	0.10	0.09	0.04	0.04	0.06	0.09	0.11	
Fresh Vegies	0.17	0.20	0.33	0.15	0.23	0.36	0.14	
Vegies Frozen	0.17	0.14	0.02	0.14	0.14	0.28	0.17	
Vegies CND	0.00	0.00	0.00	0.04	0.00	0.00	0.10	
Tomato Paste	0.00	0.00	0.06	0.05	0.05	0.00	0.10	
TOTAL SERIAL 6	0.68	0.68	0.58	0.53	0.60	0.96	0.95	0.71
SERIAL 7								
Mixed loaves	0.33	0.45	0.18	0.24	0.34	0.34	0.29	
Flour plain	0.20	0.13	0.17	0.14	0.21	0.17	0.09	
Potatoes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Rice	0.00	0.65	0.60	0.27	0.52	0.00	0.01	
Biscuits Cracker	0.00	0.00	0.00	0.00	0.00	0.03	0.00	
Biscuits Sweet	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Pasta Dry	0.00	0.00	0.22	0.50	0.16	0.23	0.83	
Cornflour	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mixed cereals	0.00	0.02	0.00	0.01	0.02	0.02	0.00	
Prep mixes	0.00	0.00	0.08	0.04	0.05	0.04	0.01	
TOTAL SERIAL 7	0.53	1.25	1.25	1.20	1.28	0.83	1.22	1.08
SERIAL 8								
Butter	0.25	0.23	0.16	0.33	0.26	0.68	0.57	
Margarine	0.76	0.36	0.15	0.35	0.25	0.11	1.15	
Oil	0.43	0.40	0.18	0.19	0.24	0.37	0.46	
Cream	0.00	0.00	0.31	0.00	0.04	0.00	0.00	
TOTAL SERIAL 8	1.44	0.99	0.80	0.87	0.79	1.16	2.18	1.18
SERIAL 9								
Jam	0.65	0.58	0.11	0.16	0.00	0.00	0.00	
Golden syrup	0.00	0.00	0.00	0.00	0.02	0.00	0.00	
Honey	0.16	0.26	0.00	0.07	0.00	0.00	0.00	
Vegemite	0.71	0.00	0.00	0.00	0.39	0.00	0.00	
Peanut Butter	0.00	0.44	0.00	0.00	0.61	0.00	0.00	
Lemon Spread	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Cheese spread	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
TOTAL SERIAL 9	1.52	1.28	0.11	0.23	1.01	0.00	0.00	0.59

Appendix 6 continued**DINNER**

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Weekly average
SERIAL 10								
Sugar White	0.12	0.11	0.05	0.05	0.07	0.10	0.13	
Sugar Brown	0.00	0.00	0.29	0.27	0.38	0.55	0.60	
Sugar Castor	0.00	0.00	0.08	0.10	0.05	0.19	0.10	
Sugar icing	0.00	0.00	0.03	0.04	0.02	0.08	0.04	
Jelly crystals	0.00	0.00	0.00	0.03	0.03	0.02	0.00	
Topping	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
TOTAL SERIAL 10	0.12	0.11	0.45	0.49	0.54	0.94	0.86	0.50
SERIAL 13								
Tea	0.24	0.22	0.10	0.10	0.13	0.20	0.25	
Coffee instant	0.05	0.05	0.02	0.02	0.03	0.04	0.05	
Milo	0.01	0.01	0.01	0.01	0.01	0.01	0.01	
Drinking choc.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Cordial	0.34	0.31	0.14	0.15	0.18	0.28	0.35	
TOTAL SERIAL 13	0.64	0.59	0.27	0.28	0.35	0.54	0.68	0.48

Appendix 7: Nutritional Composition of Meal Based Ration Scale

BREAKFAST

<u>Group</u>	<u>Serial</u>	<u>Basic Item</u>	<u>Entitlement (g or ml)</u>	<u>Energy (kl)</u>	<u>Protein (g)</u>	<u>Fat (g)</u>	<u>CHO (g)</u>
Milk and Milk Products	1	Milk Whole Fresh	250	722	8.5	9.7	11.7
	2	Meat Cuts Boneless	50	288	10.6	3	0
	3	Eggs Fresh	1 No	327	7.0	5.6	0.2
	4	Bacon Rashers	30	393	4.6	8.5	0.1
	5	Potatoes Fresh	-	-	-	-	-
	6	Fresh Fruit and Veg. Assorted	200	306	2.15	0.35	17.3
Bread and other cereals	7	Bread Fresh	200	2080	17.2	5.0	94.6
Table and Cooking Fats	8	Butter/Margarine	15	456	0.1	12.2	0.1
Sugars Jams and Honey	9	Jam Assorted	12	128	0	0	7.9
Beverages	10	Sugar	30	480	0	0	30
	11	Tea	3	-	-	-	-
	12	Fruit Juice	90	169	0.4	0.2	10.3
		TOTAL		5349	50.55	44.55	172.2

CONTRIBUTION OF PROTEIN FAT AND CARBOHYDRATE TO ENERGY (P:F:C) =
16:31:52

Appendix 7 continued

Nutritional Composition of Meal Based Ration Scale

LUNCH/DINNER

<u>Group</u>	<u>Serial</u>	<u>Basic Item</u>	<u>Entitlement</u> <u>(g or ml)</u>	<u>Energy</u> <u>(kJ)</u>	<u>Protein</u> <u>(g)</u>	<u>Fat</u> <u>(g)</u>	<u>CHO</u> <u>(g)</u>
Milk and Milk Products	1	Milk Whole Fresh	200	578	6.8	7.8	9.4
Meat and Meat Products	2	Meat Cuts Boneless	175	1008	37.1	10.3	0
Eggs fresh	3	Eggs Fresh	-	-	-	-	-
Bacon Rashers	4	Bacon Rashers	-	-	-	-	-
Vegetables and Fruit	5	Potatoes Fresh	200	448	3.9	0.2	21.6
	6	Fresh Fruit and Veg. Assorted	350	534.5	3.8	0.65	30.25
Bread and other cereals	7	Bread Fresh	175	1820	15.0	4.4	82.8
Table and Cooking Fats	8	Butter/Margarine	25	760	0.2	20.3	0.3
Sugars Jams and Honey	9	Jam Assorted	10	107	0	0	6.6
	10	Sugar	25	400	0	0	25
Beverages	11	Tea	3	0	0	0	0
	12	Fruit Juice	-	-	-	-	-
			TOTAL	5656	66.8	43.65	175.95

CONTRIBUTION OF PROTEIN, FAT AND CARBOHYDRATE TO ENERGY (P:F:C) =
20:29:50

Appendix 8: Nutritional Composition of Food Intake at East Hills ORs Mess

Measured nutrient intake per diner per day based on servery figures (bracketed figures are percent of energy)

Nutrient	Breakfast (n=523)			Lunch (n=839)			Dinner (n=845)			Total		
	Intake	Plate waste	Servery waste	Intake	Plate waste	Servery waste	Intake	Plate waste	Servery waste	Intake	Plate waste	Servery waste
Water (g)	501.7	7.7	25.4	587.51	24.3	71.5	599.15	21.7	120	1688.4	53.7	217.1
Energy (kJ)	3561	128	214	5085	237	336	5162	177	922	13808	542	1472
Protein (g)	34 (16)	1.8	3.1	58 (19)	2.8	4	55 (18)	1.6	12	147 (18)	6.2	19.1
Fat (g)	37 (38)	1.2	3.3	56 (40)	2.5	3.3	59 (43)	1.7	10	152 (41)	5.5	16.9
CHO (g)	97 (44)	3.1	2.3	122 (39)	5.8	8.9	122 (38)	5	20.4	342 (40)	14	31.6
Fibre (g)	5.4	0.2	0.4	9.76	0.6	2.3	8.9	0.5	2.5	24	1.4	5.3
Na (mg)	1353	89	96	1396.67	71	112	1458	43	312	4207.9	202.3	519.7
K (mg)	1121	31	66	1820.54	98	200	1905	76	361	4847	205	627.6
Ca (mg)	487	7	15	393.16	8	22	400	5	34	1280	19.4	71
P (mg)	648	26	43	739.21	32	53	689	19	101	2076.6	76.5	197.9
Mg (mg)	84	3	4	121.03	6	14	120	4.5	25.5	325	13.4	43.9
Fe (mg)	5.6	0.3	0.6	7	0.4	0.8	6.7	0.3	2.4	19.3	0.9	3.7
Zn (mg)	3.5	0.2	0.2	6.11	0.3	0.5	6	0.2	1.3	15.6	0.6	2.0
Retinol (ug)	365	5	28	435.85	24	136	598	35	156.8	1398	63.6	321.2
Thiamin (mg)	0.79	0.04	0.03	0.58	0.02	0.07	0.77	0.03	0.25	2.1	0.1	0.4
Ribo (mg)	1.19	0.03	0.06	1	0.04	0.08	1.08	0.02	0.11	3.3	0.1	0.3
Niacin (mg)	12.5	0.7	0.9	19.58	0.9	1.3	19.8	0.5	3.55	52	2.2	5.7
Vit C (mg)	32	0	1	60.26	4	18	60	3	13	151.8	7.2	31.3
Sat Fat (g)	14.6	0.4	1.1	18.48	0.7	0.7	20	0.5	2	53.1	1.6	3.9
Poly (g)	11.3	0.5	0.9	15.9	0.6	0.6	16	0.3	2.5	43.3	1.4	4.1
Mono (g)	5.7	0.1	0.2	5.54	0.2	0.3	6	0.1	0.7	17.3	0.5	1.3

Appendix 9: Diner Survey Results

(i) Breakfast 28-29 November 1996

Question 1. Were you satisfied with the quantity of bread, muffins and crumpets available at today's breakfast.

	28 Nov	29 Nov
Yes	38	52
No	5	6
Total	43	58

Question 2. Would you like to have croissants available in addition to bread, muffins and crumpets.

	28 Nov	29 Nov
Yes	30	47
No	10	13
Total	40	60

Question 3. Was there enough breakfast cereal this morning.

	28 Nov	29 Nov
Yes	22	36
No	32	21
Total	54	57

Question 4. Was the variety of the breakfast satisfactory.

	28 Nov	29 Nov
Yes	20	34
No	24	26
Total	44	60

Question 5. If your answer to question 3 was NO, what additional cereals would you like to have available at breakfast.

	28 Nov	29 Nov
Coco Pops	8	13
Fruit Loops	2	7
Sultana Bran	5	
Rice Bubbles	4	4
Special K	2	7
Corn Flakes	2	11
Just Right	1	
Muesli		2
Sustain		1
Nutri Grain		3
Mini Wheats		2
Total	24	50

Question 6. Were you satisfied with the amount of bacon you were allowed to take this morning.

	28 Nov	29 Nov
Yes	18	10
No	17	27
Total	35	37

Question 7. If your answer to question 6 was No, how important is it to you.

	28 Nov	29 Nov
Very Important	8	17
Fairly Important	9	14
Not Important	9	3
Total	26	34

Question 8. Were you satisfied with the amount of eggs you were able to take this morning.

	28 Nov	29 Nov
Yes	29	12
No	6	24
Total	35	36

Question 9. If your answer to question 8 was No, how important is it to your to be able to have more eggs.

	28 Nov	29 Nov
Very Important	4	13
Fairly Important	5	11
Not Important	1	
Total	10	24

Question 10. Were you able to obtain enough milk for your needs at breakfast this morning

	28 Nov	29 Nov
Yes	46	52
No	6	
Total	52	52

Question 11. Were you satisfied with the range of other hot foods on the point (Baked Beans, tomatoes, mushrooms, pancakes).

	28 Nov	29 Nov
Yes	23	27
No	16	11
Total	39	38

Question 12. If your answer to question 11 was No, what other foods would you like to see added to the range of hot foods.

	28 Nov	29 Nov
Creamed sweet corn	6	1
Sausages	18	16
Grilled steak	10	4
Spaghetti	16	15
French toast	1	
Pancakes	1	
Croissants	1	1
Mince	1	
Fruit	2	
More bacon		1
Total	56	38

Question 13. Were you satisfied with the range of spreads available.

	28 Nov	29 Nov
Yes	29	21
No	6	10
Total	35	31

Question 14. If your answer to question 13 was NO, what additional spreads would you like.

	28 Nov	29 Nov
Vegemite	7	15
Cheese spread	3	1
Jams	2	6
Salad sauces	1	
Promite		1
Nutella		2
Maple syrup		1
Peanut butter		8
Total	13	34

Other Comments

	28 Nov	29 Nov
Too long to get hot meal	5	
Orange juice instead of cordial	3	
Require new toasters	1	
More food	5	
More orange juice		3
More than one egg		4
Breakfast too early (have B/fast after PT)		1
More healthier types of food		1
Drain oil from bacon		1
More and better quality fruit		2
No napkins on tables		3
Total	14	15

Appendix 9 cont'd

(ii) Diner Survey Results for Dinner 28/29 November 96

Question 1. For the following foods, please give your opinion of the range, quality and quantity of food you were able to have for tonight's dinner.

		Vegetables		Desserts		Main Courses	
		28 Nov	29 Nov	28 Nov	29 Nov	28 Nov	29 Nov
Range	Adequate	26	55	20	31	28	46
	Inadequate	10	4	10	10	7	4
Total		36	59	30	41	35	50
Quantity	Enough	26	51	14	26	21	41
	Not Enough	11	4	16	14	14	9
Total		37	55	30	40	35	50
Quality	Poor	2	1	2	4	3	2
	Fair	27	16	16	17	17	10
	Good	8	37	10	19	16	32
	Very Good		2	1	2		8
Total		37	56	29	42	36	52

Question 2. If you answered NOT ENOUGH for the quantity of main course, how severely did this affect your enjoyment of the meal.

	28 Nov	29 Nov
Not much		2
Moderately	9	6
Greatly	13	3
Total	22	11

Question 3. Was there adequate bread for your meals.

	28 Nov	29 Nov
Yes	30	45
No	5	5
Total	35	50

Question 4. Was there adequate milk.

	28 Nov	29 Nov
Yes	21	39
No	13	10
Total	34	49

Question 5. For the main course only, would you prefer to serve yourself or have a cook place the main course on your plate.

	28 Nov	29 Nov
Served by cook	1	7
Self serve	37	47
Total	38	54

Question 6. Would you generally prefer to take your meal from the servery pre-cooked or have it cooked to order when you arrive.

	28 Nov	29 Nov
Pre-cooked	17	32
Cooked to Order	6	8
Total	23	40

Question 7. Is there enough pasta served.

	28 Nov	29 Nov
Yes	23	45
No	11	7
Total	34	52

Question 8. Is there enough rice.

	28 Nov	29 Nov
Yes	29	45
No	2	12
Total	31	57

Question 9. Is food cooked too often in fat for your taste.

	28 Nov	29 Nov
Yes	26	38
No	5	14
Total	31	52

Question 10. Would you like to have access to reduced fat as well as whole milk.

	28 Nov	29 Nov
Yes	18	33
No	13	22
Total	31	55

Other Comments

	28 Nov	29 Nov
More variety in cold drinks	2	
More chocolate icecream	3	1
More variety of main course	2	
More serviettes	4	6
Vegetables were undercooked	2	
Rice not cooked properly	2	
Dirty cutlery	2	
Need steak knives	4	6
Poor standard of meals	6	1
Poor quality of fruit		2
Extended meal times		3
Why do we have to wear collared T-shirts		5
Total	27	24

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